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GENUS OIDEMIA

7. *O. perspicillata*, ♂ AD.
8. *O. perspicillata*, ♂ JUV.
9. *O. fusca*, ♂ AD.

4. *O. deglandi*, ♂ AD.
5. *O. deglandi*, ♂ JUV.
6. *O. carbo*, ♂ AD.

1. *O. americana*, ♂ AD.
2. *O. americana*, ♂ JUV.
3. *O. nigra*, ♂ AD.

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THE MOULTS AND PLUMAGES OF THE SCOTERS,— GENUS OIDEMIA.

BY JONATHAN DWIGHT, JR., M. D.

Plates XXIV-XXX.

THE Scoters are a group of sea-ducks best known when adult by their black plumage and bright colored, bulging bills. They are widely distributed during the breeding season in the arctic and sub-arctic portions of the Northern Hemisphere and move southward in the winter to temperate latitudes where they are found in great numbers. Three species, *nigra fusca*, and *carbo*, are peculiar to the Old World, and three, *americana*, *perspicillata* and *deglandi* are found in the New, where along our Atlantic coast they are popularly known to many of our gunners as "Coots."

Historically considered the Scoters are of respectable antiquity, for the very early writers on birds have had something to say about them. In 1555, Belon (L'Hist. Nat. Oyseaux) seems to refer to a sea-duck, and in 1560, Gesner (Icon. Animal., p. 76) mentions "*Anas fera fusca*" but at best fourteenth century descriptions are too vague and imperfect to make much out of them. In 1634, however, Aldrovand (Ornith., iii, p. 234) not only describes the common European species *fusca* under the title "De anate nigra, rostro nigro, rubro & luteo" but also inserts a strange-looking wood-cut of the duck with the white wing band and eye-crescent

most conspicuous. In 1650–1653, Jonston (Nat. Hist. Avium, p. 98) mentions this bird which he figures on plate 49 with a white wing band, calling it "*Anas fusca fera*," but the first author recognizing two species seems to have been Willughby (Ornithol. 1676). At p. 363 he proposes the name "Velvet-Duck" for "Aldrovandus his black Duck," reproducing the latter's wood-cut on plate LXX, and calling the bird "*Anas niger major*." He describes a second species at p. 280 which he calls "*Anas niger minor*," figuring it on plate LXXIV, and this is evidently what is known as *nigra* today. In 1713, Ray (Synop. Avium, p. 141) describes "*Anas niger*" (= *fusca*) and "*Anas niger minor*" (= *nigra*) and in 1746 Linnæus (Fauna Suecica, p. 38, Nos. 106, 107) describes "*Anas fusca*" and what seems to be an immature *nigra*, but like most of the old writers much is made of the unimportant characters which are shared by many birds, and the real differences are completely missed. This failing, however, I am sorry to say is not confined entirely to the pioneers in ornithology.

In 1750, Edwards (Nat. Hist. Birds, iii, p. 155) describes the "Great Black Duck from Hudson's Bay" which his colored plate — the first of any Scoter — shows is *perspicillata*, and in 1758 Linnæus (Syst. Nat. i, pp. 123 and 125) gives the names "*Anas fusca*," "*Anas nigra*" and "*Anas perspicillata*" to the three species that retain his specific names to this day. In 1760, Brisson (Ornithologie, vi, pp. 420–427) describes at considerable length the three species as "*Anas nigra*" (= *nigra*), "*Anas nigra major*" (= *fusca*) and "*Anas nigra major Freti Hudsonis*" (= *perspicillata*) and many later writers might be cited. It would be out of place to review their statements in this brief sketch for a volume could be filled correcting and explaining the many blunders that have been made. My chief object is rather to clear up such obscurity as still remains. It may be of interest, however, to call attention to the fact that the two American species of Scoters were long confused, *americana* with the European *nigra* and *deglandi* with *fusca*, and not until 1831 did Swainson and Richardson (Faun. Bor. Amer., ii, p. 450) recognize *americana* as distinct, while it was 1850 when Bonaparte (Rev. Crit. Orn. Europe, p. 108) separated *deglandi*. Finally, *carbo* was recognized as a full species in 1887 by Ridgway (Man. N. Am. Birds, p. 112) under the name *stejnegeri*. There are therefore in all

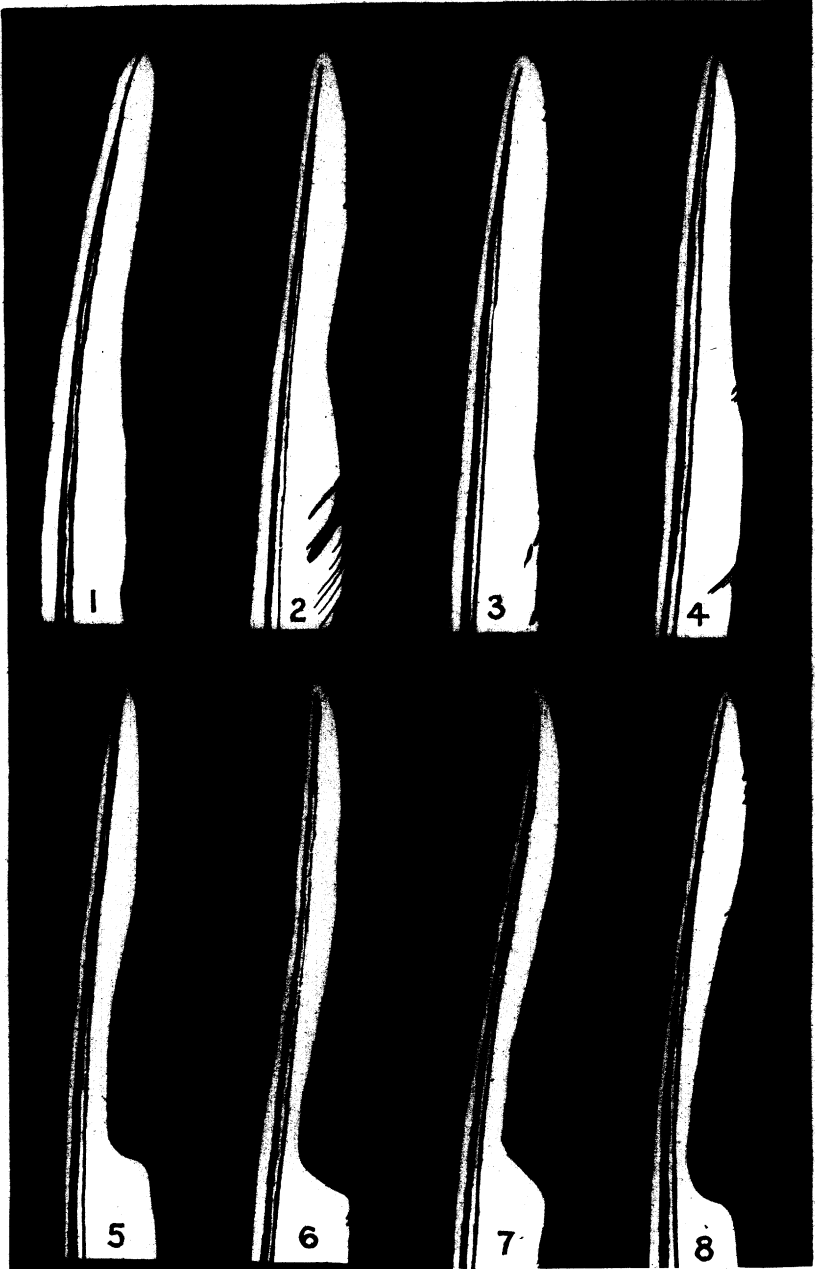
six species in the genus *Oidemia*, the heads of which (Plate XXIV) have been drawn and colored true to life and in most cases from fresh birds by Mr. Henry Thurston. The feathering of the bills is diagnostic of each in all plumages.

The question of genera need not detain us long. I am not one who believes in making generic distinctions so fine that nothing is left except monotypic groups and it seems to me that there should be some difference between a genus and a species. Unless we recognize the six species now in *Oidemia* as congeneric, there should be six genera. Fleming (Philos. of Zool., ii, p. 260, 1822) established the genus *Oidemia* (later spelled *Ædemia*) and although five other genera have since then had more or less vogue, there seems no good reason for recognizing any of them.

In view of all that has been written about the Scoters during the many years that they have been known to ornithologists, it would seem superfluous to add to a literature that already seems replete were it not that very little has been published bearing directly upon the moult itself and the way that it is related to plumages. Over a dozen years ago I took up the study of the moult of the Scoters making use of specimens that were freshly killed. In this way it has been possible for me to follow the plumage changes much more accurately than merely with dried skins and now with the large series at hand that were first so studied, I am prepared to show some new facts and correlate a good many others that have been imperfectly understood. My own collection includes the following specimens, viz. *Oidemia americana*, 18 adult males, 6 adult females, 10 young males and 3 young females; *O. perspicillata*, 23 adult males, 6 adult females, 21 young males and 10 young females; *O. deglandi*, 23 adult males, 9 adult females, 10 young males and 22 adult females; *O. carbo*, 2 adult males; *O. fusca*, 3 adult males; and *O. nigra*, 3 adult males, 1 young female, and 1 downy young. The bulk of my specimens came from Long Island, New York, but besides my own birds I have examined fully as many others in other private and public collections kindly placed at my disposal. As a consequence I have had no dearth of material except perhaps of breeding birds, and have been able to piece out very complete series of most of the species, representing every month in the year.

The question is sometimes asked: How may the age of ducks be determined? There are several ways of approximating this in wild birds. Of course young birds show several skeletal characters that persist for many months, but the plumage — once it is known — gives us the clue that lasts the longest. It is singular that none of our American authorities since Nuttall in 1834 has ever made mention of the important emarginate first, or distal primary of adult males of *americana*, nor have foreign writers on the moult of *nigra* recognized its value. The like feather in young birds of this species is of quite a different shape, a fact of importance because, until a bird is a year old, the primary marks him as a young bird no matter what sort of plumage he may assume. For the reason that neither this nor the other primaries in ducks are moulted more than once in a year this one feather is a key to the many so called "immature" plumages. I have illustrated (Plate XXV) the differences between the tapering feather tip in young males (Figs. 1-4) and the cut or emarginate tip in adults (Figs. 5-8). The same condition prevails in the European species *nigra* as shown by Plate XXVI (Figs. 1 and 5) where, for comparison, I have also placed male *perspicillata* (Figs. 2 and 6), *deglandi* (Figs. 3 and 7), and *fusca* (Figs. 4 and 8) young and old. I have also added Plate XXVII making a similar comparison between young and adult females of *americana* (Figs. 1 and 5), *deglandi* (Figs. 2 and 6), *fusca* (Figs. 3 and 7) and *perspicillata* (Figs. 4 and 8). This method, which consists of holding the feather over blue-print paper, might be called an avian Bertillon system with wing tips instead of fingers for identification, and I feel confident that it may hold some future possibilities. While a great variation is here shown by the wing prints it should be noted that even where the differences between the young and the adult bird overlap, there is a tendency for the adults of the Scoters to have larger, wider feathers, with the exception of *americana* and *nigra* which alone have the singular cut or emarginate primary in the adult.

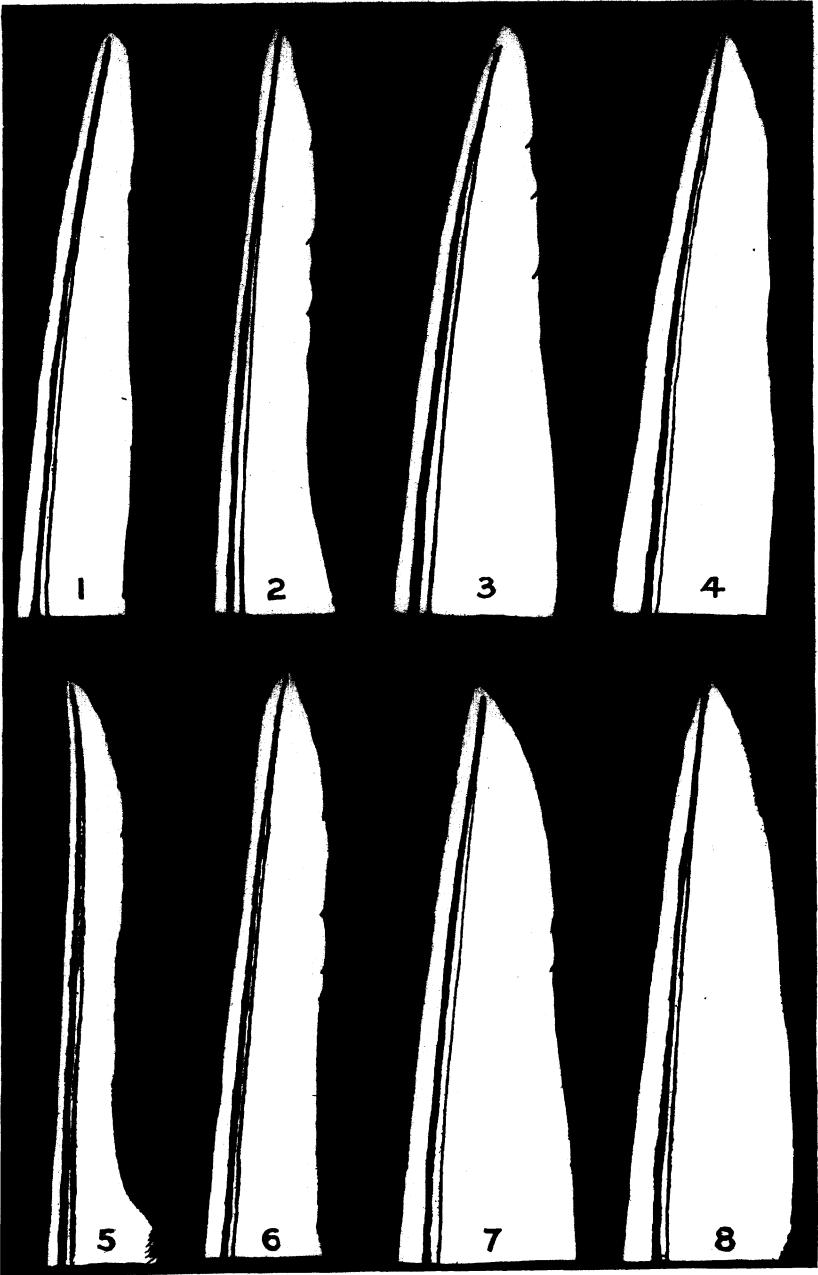
As the moults of all the Scoters of the New World, and probably those of the Old are the same and the sequence of plumages identical, a better understanding of them may be obtained by taking them up in natural sequence. The growth of new feathers always begins at definite points, just as it does in other birds, and extends



DISTAL PRIMARIES OF *OIDEMIA AMERICANA*.

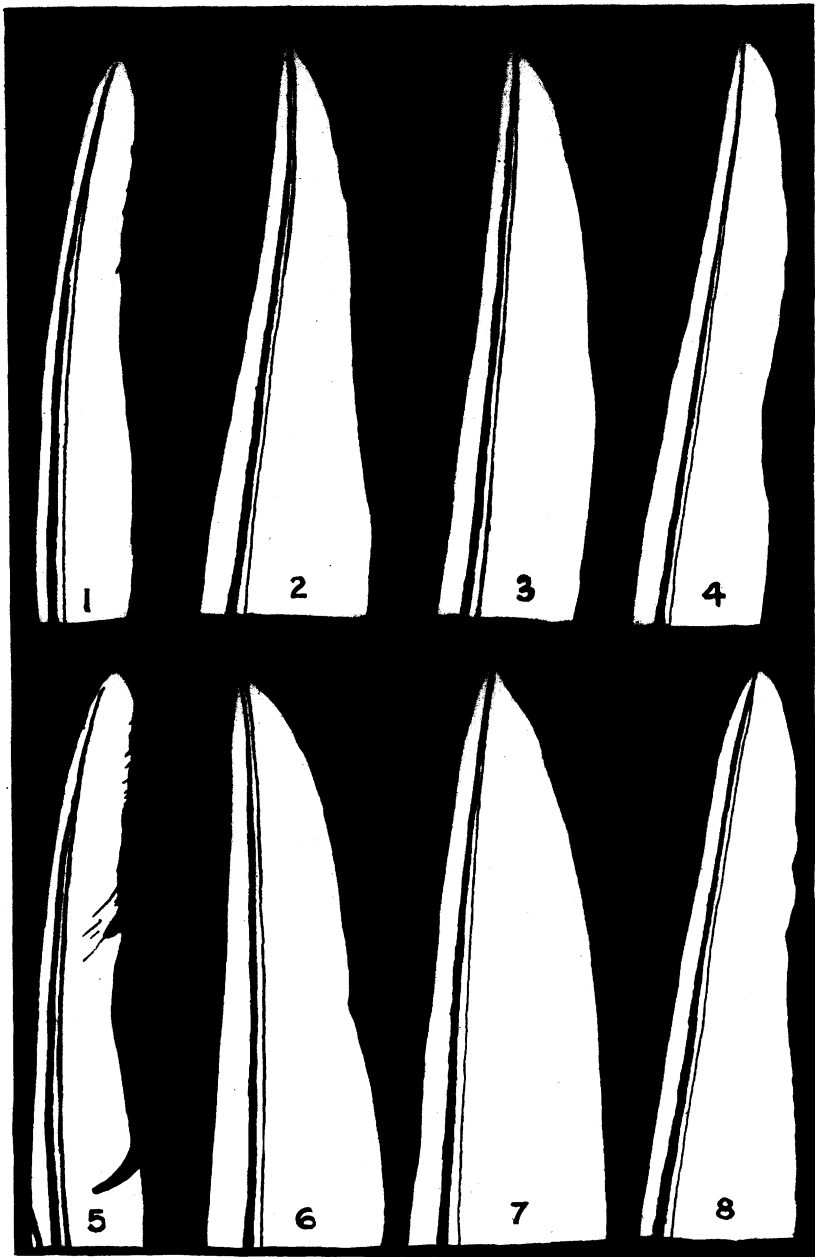
Young males, Figs. 1-4.

Adult males, Figs. 5-8.



DISTAL PRIMARIES OF MALES.

<i>Oidemia nigra</i> ,	young male,	Fig. 1;	adult,	Fig. 5.
" <i>perspicillata</i> ,	" "	Fig. 2;	" "	Fig. 6.
" <i>deglandi</i> ,	" "	Fig. 3;	" "	Fig. 7.
" <i>fusca</i> ,	" "	Fig. 4;	" "	Fig. 8.



DISTAL PRIMARIES OF FEMALES.

- | | | | | |
|----------------------------|---------------|---------|--------|---------|
| <i>Oidemia americana</i> , | young female, | Fig. 1; | adult, | Fig. 5. |
| " <i>deglandi</i> , | " " | Fig. 2; | " " | Fig. 6. |
| " <i>fusca</i> , | " " | Fig. 3; | " " | Fig. 7. |
| " <i>perspicillata</i> , | " " | Fig. 4; | " " | Fig. 8. |

along definite paths. This shows clearly in the Scoters where the black feathers of the head begin to show chiefly anteriorly and the moult moves slowly backward, leaving a gap on the neck before it joins the spot on the breast and back where a similar backward movement has been in progress (Plate XXVIII, Fig. 2; XXIX, Fig. 2; and XXX, Fig. 2). Feather growth next extends along the sides and flanks and the last area to be affected by a moult is the middle part of the abdomen (Plate XXVIII, Fig. 3; XXIX, Fig. 3; and XXX, Fig. 3), although in the downy chick this area is clothed before the wing-quills sprout.

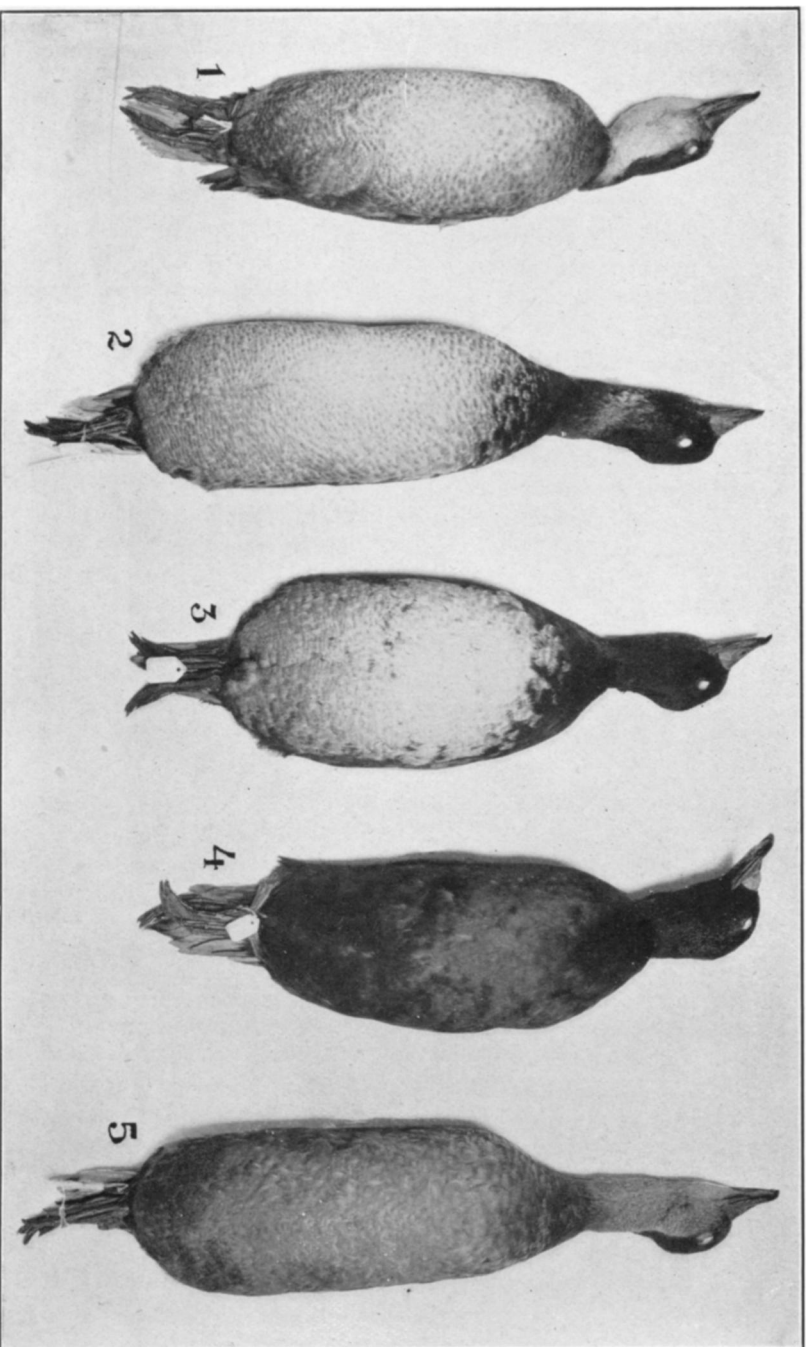
There is no haphazard growth. Moult may be delayed, especially in females, or it may be checked in some young birds before it has extended as far as it does in others, but birds of the same age have approximately the same plumages. The difficulty has always been to classify plumages and moults by name, and this is particularly difficult in the Scoters because there is no month in the whole year when some individuals may not be found moulting. Especially is this true of young birds arriving from the northern breeding grounds, in full juvenal plumage, some showing the growth of a few winter plumage feathers in October and others being no farther advanced in March. Furthermore some males have become largely black by January while others are at a similar stage in April, so that young birds may be found in active moult throughout the entire winter. Specimens examined when freshly-killed show many pin feathers that easily escape notice in skins and I am convinced that there are two moults concerned in the changes of the first winter, a partial postjuvenal and a partial prenuptial. Both produce black feathers in the male and brown ones in the female, but where one leaves off and the other begins it is impossible to say. As we find new black feathers among old black ones we may assume such birds have undergone two moults, but as a rule we find new black among brown feathers only which indicates the postjuvenal moult and the growth of first winter feathers. When such growth occurs in spring birds however it seems rather absurd to call them first winter feathers rather than first nuptial, but we must either do this, consider the first winter plumage suppressed in some individuals, or consider the postjuvenal moult as aborted and its place taken by the prenuptial. It is merely a question of what

is the best way of expressing facts and as the stages of moult and of plumage overlap and it is simplest to draw an arbitrary line somewhere.

During the first winter, the knobs and bulgings of the bills of males gradually appear as well as the colors that are peculiar to them and to the legs and feet. The iris, brown in all females, in all young birds of both sexes and in the adults of *americana* and *nigra*, in males becomes pale yellow during the winter and by the end of the year white in *deglandi*, *carbo*, *fusca* and *perspicillata*. After the complete first postnuptial moult in August, young birds are scarcely distinguishable from adults, although in some the plumage is not so black and the bills are less bulged. From now on adults, both male and female, not only have a complete postnuptial moult each August or September, when through simultaneous loss of all the wing-quills, they lose the power of flight, but they also undergo a partial prenuptial moult in March and April which involves the body plumage and the tail, never the remiges of the wings. I have yet to see an adult bird of any of the species taken in the spring which is not in active moult, and that this stage of moult should have been completely overlooked is a matter that may well surprise us. I do not find evidence of any eclipse plumage in the Scoters as is claimed by a recent writer, a point to be discussed later. With these preliminary remarks which apply indiscriminately to any of the Scoters, we may take up each species in turn and show the development of its plumages and moults. I cite by number only such specimens as seem worthy of special notice in order to fix a day or to emphasize a fact.

Oidemia americana.

Natal Down. The only specimen examined (Am. Mus. No. 76845, Gichiga, N. E. Siberia, Aug. 17) is one about half grown and it already has acquired some of the juvenal plumage. The bird seems to be indistinguishable from a younger specimen of *nigra* (J. D., Jr. No. 30919, July 30) from Norway. It is dark brown above and lighter below, an indistinct collar separating the breast from the still whiter chin and throat; a dark brown cap is indistinctly outlined foreshadowing that of the next plumage. The



OIDEMIA AMERICANA.

Fig. 1. Juvenal plumage, male and female.

Figs. 2 and 3. Juvenal plumage plus first winter, male.

Fig. 4. Adult male.

Fig. 5. Adult female.

wing-quills are just showing with the down still adherent at their apices. The tail is grown and much worn illustrating the fact that in the duck, a water fowl, the tail develops earlier than do the flight feathers which is contrary to the order of moult in land birds. The scapulars and breast feathers are partly grown.

Juvenal Plumage (Plate XXVIII, Fig. 1), acquired by a complete post natal moult, and in this dress the sexes are alike although females average a little smaller in most of their measurements. It is unsafe without dissection to attempt to distinguish the sexes until feathers of the first winter plumage begin to appear together with the later changes in the color and form of the bill in the male. Young males arriving from the north in October (J. D., Jr., No. 9798, Oct. 26) and in early November (J. D., Jr., No. 4716, Nov. 8) soon begin to show a scattered growth of black feathers and later the females show brown feathers but the juvenal dress may be worn in some cases for several months before the postjuvenal moult sets in. A spring female (J. D., Jr., No. 4867, March 4), for example, is wholly in juvenal plumage with merely a few new feathers beginning to appear. *O. nigra* and *americana* are practically alike in this plumage, being brown above with a dark cap and lighter below, but the bill of *nigra* is rather heavier; *deglandi*, *carbo*, *fusca* and *perspicillata* are brown above, lighter below and show two large white spots on the side of the head, and *deglandi*, *carbo*, and *fusca* have white wing patches.

1st Winter Plumage (Plate XXVIII, Figs. 2 and 3), acquired by a partial postjuvenal moult which never includes the wings and seldom the lower surface of the body. At most the head, neck, back and sides become black in males and a much less extensive growth of brown feathers occurring relatively later takes place in females. The tail too is moulted, the rectrices showing irregularities in their replacement. The moult probably progresses slowly but it must be remembered that in the winter while we see individuals in all stages no doubt they begin to moult at widely different dates and it is impossible to say just how long any one bird has been actually moulting. I am convinced that males which are well advanced by January, also undergo a prenuptial moult in April or May, like adults, but it is difficult to tell whether the specimens which are moulting at this late period are undergoing a much

delayed postjuvenal or a distinct prenuptial moult. The results are the same so far as the plumage is concerned, the new feathers being black in each case, but, if there be a prenuptial moult, three different generations of feathers can be found while as a rule only two are demonstrable. The most developed specimen I have seen (J. D., Jr., No. 4412, ♂, April 20), is almost wholly black except the wings and a few scattered brown feathers on the abdomen and the back, but we have no means of knowing how many birds reach this advanced stage — probably very few. The abdomen, as a rule, becomes darker anteriorly and posteriorly as the feather edgings are narrower here and sooner show the dark basal part as they wear off and the fading is considerable.

Shortly after new feathers appear, the bill of the young male begins to take on the colors of the adult and still more gradually assumes its shape. The colors may closely approximate, by the end of the winter, those of the adult, but the shape is not perfected for at least a year, the swelling of the hump not being marked in the first winter birds although the yellow color may be brilliant. The bill of the female and the legs and feet of the male remain dusky, adults differing very little from young birds.

No matter how black the plumage may be nor how bright the colors of bill or feet, young males may infallibly be told from adults by the shape of the first primary (Plate XXV) which is not replaced until the first postnuptial moult. The iris in *americana* is always brown in both sexes at all ages.

1st Nuptial Plumage. This is either the first winter plumage plus more or less wear, being therefore a mixture of much worn juvenal and less worn first winter feathers, or it is, in part, the result of a first prenuptial moult. It is pretty well established from observations on birds in captivity that no ducks breed until their second year.

2d Winter Plumage, acquired by a complete first postnuptial moult. It is probable that this moult begins in July, but a lack of specimens prevents me from giving exact dates. A specimen of Dr. L. B. Bishop's (No. 557, August 28) is a male that has nearly completed this moult and acquired the emarginate primary. There are enough worn brown juvenal feathers remaining to show that the bird never had assumed much of the first winter dress. As a

rule the moult is almost completed when the birds reach our latitude. At this time the characteristic emarginate distal primary is assumed replacing the uncut juvenal feather (Plate XXV) and the yellow hump of the bill has in some cases reached full development. The plumage is now wholly black. As early as October 26 (J. D., Jr., No. 9796) I have seen a specimen that had ceased to show any signs of moult while others as late as November 12 (J. D., Jr., No. 11983) still show a few pin feathers growing on several of the feather tracts. There is a difference in the intensity of the black in fall specimens and we may suppose the blackest are birds several years old although it is probable that individual variation is the real factor. At all events, the duller birds are the ones that in the course of the winter show the most wear and become more or less brown in the second spring. It may be noted that the growth of the hump of the bill tilts the nostril from the more horizontal position it has in the young male. The nostrils of *deglandi* and *perspicillata* being wholly within the zone of the uplift do not lose their relative positions.

2d Nuptial Plumage (and all later nuptial plumages) acquired by a partial prenuptial moult involving the body feathers and the tail. Contrary to general opinion an extensive moult takes place at this period in both sexes. No birds of many examined in March and April fail to show abundant growth of new feathers. As these, however, are black like the old ones they replace, no change in the appearance of birds is affected save that the plumages look fresh and new.

3d Winter plumage (and all later winter plumages) (Plate XXVIII, Fig. 4, ♂; Fig. 5, ♀) acquired by a complete second postnuptial moult. Differs only from the first postnuptial plumage in that a black emarginate primary replaces a similar one instead of replacing a plain brown juvenal feather as at the first postnuptial moult. A large part of the variation in intensity of color in plumage, bills and feet is probably in consequence of some adults being only one year old while others are two or more. The adult female is uniformly dark brown above and below, whereas the juvenal female is much lighter below and shows a more distinct cap.

Oidemia perspicillata.

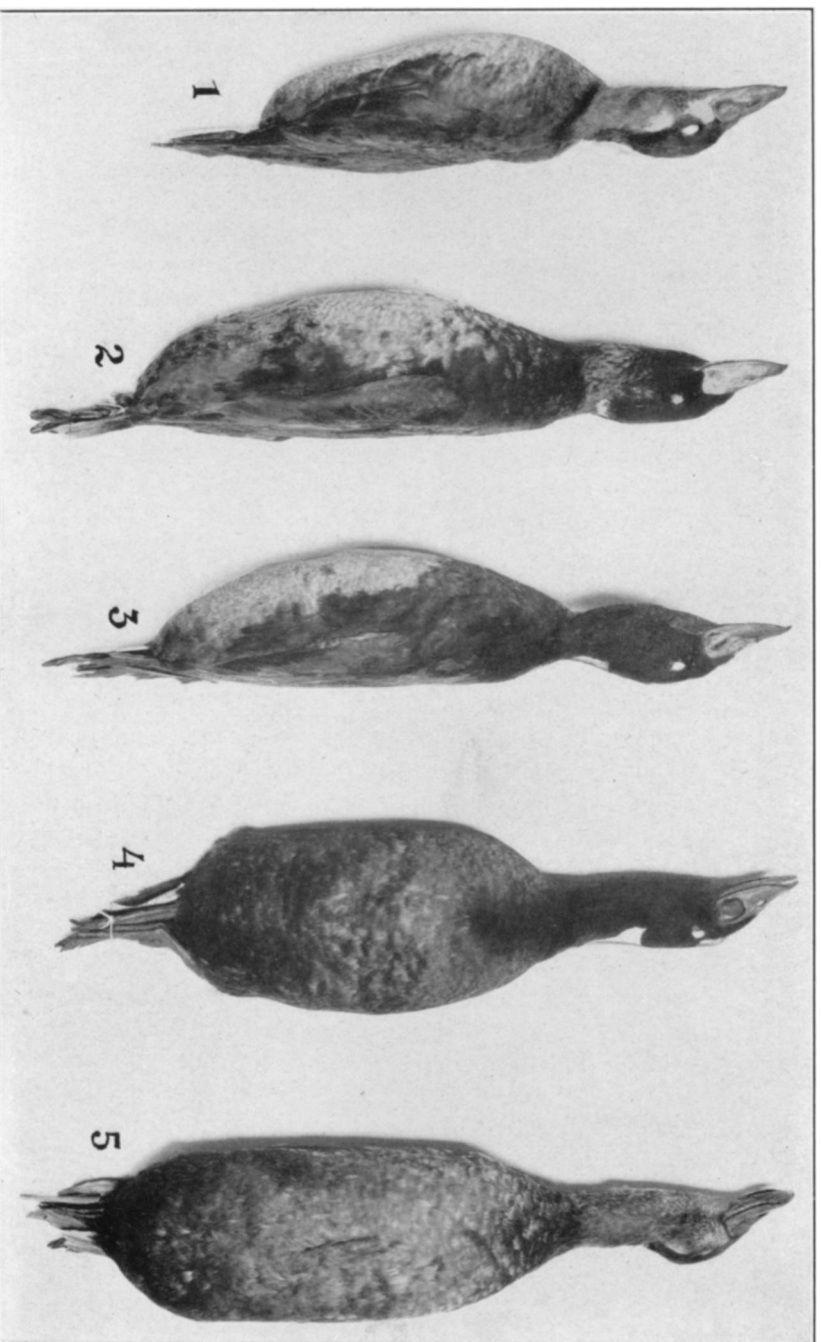
Natal Down. I know of no specimen in collections.

Juvenal Plumage (Plate XXIX, Fig. 1) acquired by a complete postnatal moult. Females are a little smaller, but in plumage the sexes are alike, the color being brown with two conspicuous white patches or rounded spots on the side of the head. These vary in size, sometimes nearly merging; the anterior is whiter and smaller, and the posterior is also smaller than in *deglandi* and they tend to become whiter with wear and fading. The absence of white on the wing separates this species from *deglandi*, *carbo* and *fusca* and the feathering of the bill is, of course, diagnostic. Birds in this plumage much worn may be found late in the winter but as a rule the growth of the first winter dress begins in October rather earlier than in *americana*.

1st Winter Plumage. (Plate XXIX, Figs. 2 and 3) acquired by a partial postjuvenal moult the extent of which is variable. A few black feathers at the corners of the mouth, along the margin of the bill, and on the interramal space may begin to show by early October (J. D., Jr., No. 34151, ♂, Oct. 2).

I have some specimens that are as far advanced in December (J. D., Jr., No. 8045 ♂, Dec. 6) as others are in March (J. D., Jr., No. 7419 ♂, March 17) or even April, such birds having the head, neck, fore-part of the body, the sides, scapular region and rump black and a single white nuchal patch. Females are more backward and more limited in their moult and the new feathers are brown instead of black. The tail is renewed during the first winter and colors come gradually into the bill and feet of males. The change in the shape of the bill is slower, a wrinkling of the black bosses being the earliest sign, but the winter has gone before bills and feet can be mistaken for those of the adult. The iris is brown in young males, becoming yellow and finally white when the bird is about a year old.

It is of interest that young males acquire only the posterior or nuchal, of the two triangular white areas that mark the head of the adult. The area where the frontal patch is developed in the old male is covered by black feathers in the young bird. The two juve-



OIDEMIA PERSPICILLATA.

Fig. 1. Juvenal plumage, male and female.

Figs. 2 and 3. Juvenal plumage plus first winter, male.

Fig. 4. Adult male.

Fig. 5. Adult female.

nal white spots on the side of the head are completely obliterated by black feathers as the postjuvenal moult progresses and the fresh white nuchal patch becomes more or less prominent varying individually greatly in extent and purity of color.

1st Nuptial Plumage. Practically the same as the first winter with wear added which creates greater havoc among the brown juvenal, than among the black first winter feathers. In some birds, perhaps many, there is a prenuptial moult which adds black feathers to those already grown or replaces them. Yearling birds do not breed and are late in beginning the postnuptial moult. A specimen (J. D., Jr., No. 4367) taken September 4 well illustrates wear as well as the delayed postnuptial moult in immature birds, for the brown feathers of wings, tail, lower parts and back are the worn and faded juvenal feathers, the black ones of head, neck, breast, and sides are of first winter (or perhaps first nuptial) while here and there a few black feathers of the second winter plumage are just beginning to appear. It might well be November before such a bird as this would complete his moult.

I find no evidence of an "eclipse" plumage as is claimed but can understand how retained brown and worn feathers of an earlier plumage could be mistaken for an "eclipse" growth.

2d Winter Plumage, acquired by a complete first postnuptial moult, at which the adult plumage is assumed. The male now has two white triangles on the head and the colored bulging bill, and the female assumes a plumage much darker than in the first winter. She loses to a large extent the two juvenal white spots on the side of the head for which are substituted an obscure anterior and a more conspicuous posterior whitish spot, both of them obscured by the dusky feather tips which later are worn off. The female too has an indistinct cap which is blacker than in *deglandi* and she may or may not have an indistinct white nuchal patch similar to the male,— the individual variation is considerable.

2d Nuptial Plumage (and all later nuptial plumages) acquired partly by wear, mostly by a partial prenuptial moult confined chiefly to the head and sides. Many birds examined in March and April show the growth of new black feathers among the old. A specimen (Amer. Mus. No. 102082) of May 19 still shows new growth giving the abdomen a mottled look and the sides a blacker tint.

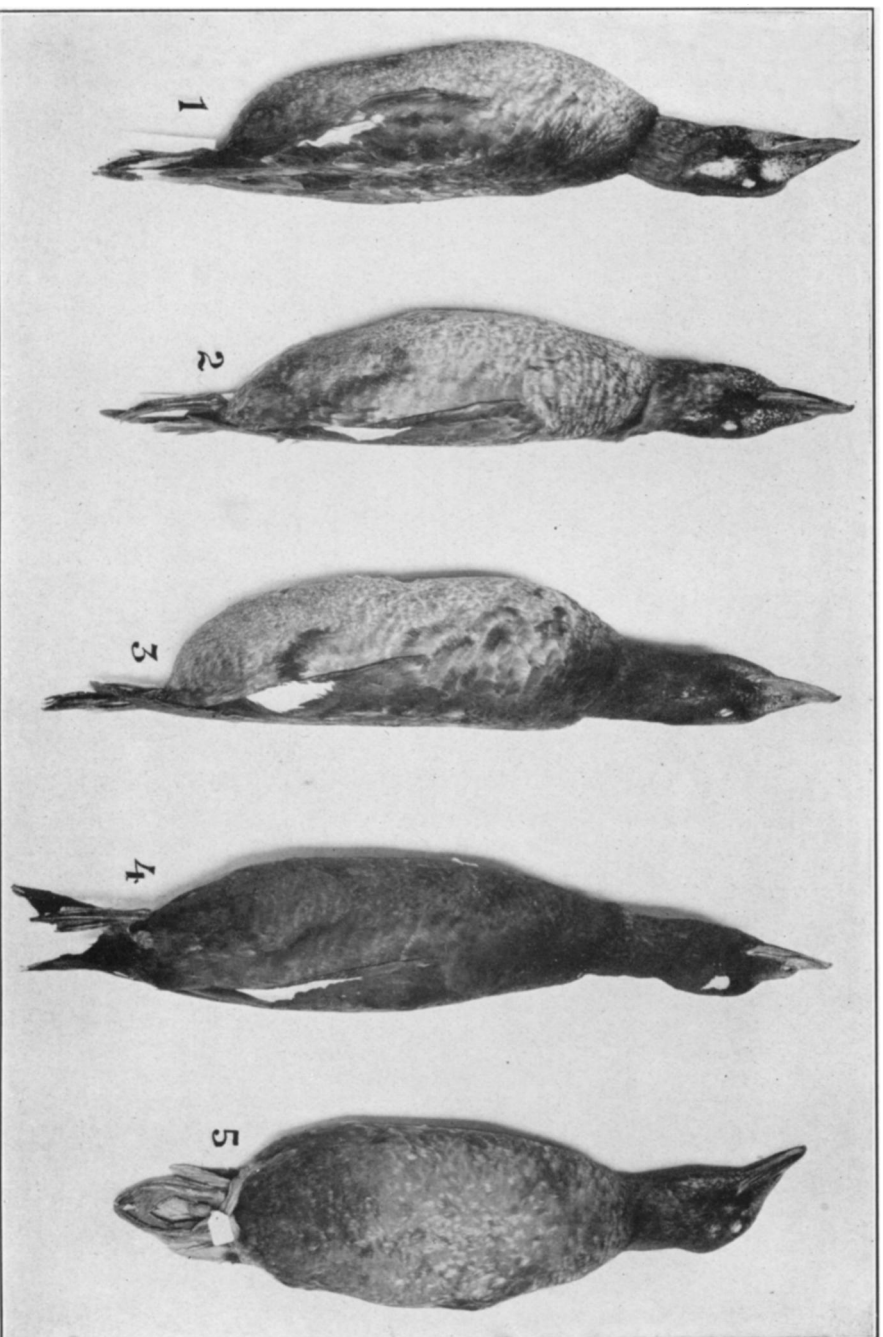
3d Winter Plumage (and all later winter plumages) (Plate XXIX, Fig. 4 ♂, Fig. 5 ♀) acquired by a complete second postnuptial moult. A specimen (Am. Mus. No. 90694 ♂, July 28) has moulted the body plumage, but still retains the wings and tail, another (Am. Mus. No. 119177 ♂, Aug. 4) is at about the same stage and still another (No. 7151 ♂, Sept. 1) is at the flightless stage having shed the wing quills. Still another (Am. Mus. No. 76208 ♂, Aug. 24) is the most advanced and has new flight-feathers, tail and body feathers mostly grown. The less highly developed bills and the browner plumage of some birds may or may not indicate less mature birds, but on account of individual variation it is impossible to guess the age of such specimens with any certainty, after they lose the last of the juvenal feathers. We must know the age of the feathers if we wish to know the age of the bird.

Oidemia deglandi.

Natal Down. Dusky brown above and dull white below, whitish under the eye and a white patch of down foreshadowing the white wing patch.

Juvenal Plumage (Plate XXX, Fig. 1) acquired by a complete postnatal moult. The white speculum distinguishes this species from all the Scoters except *fusca* and *carbo* which it closely resembles in this plumage. The light patches on the sides of the head are as a rule rather larger than those of *perspicillata* and are often of a dingier white. The posterior spot is the larger of the two and the anterior is apt to be brownish towards the bill. There is much variation, the light area often extending to the forehead and sometimes almost coalescing with the posterior spot. The feathering of the bill is diagnostic. Birds wholly in this plumage may be found from October (J. D., Jr., No. 474, ♀, Oct. 21) to April (J. D., Jr., No. 34134 ♀, April 18).

1st Winter Plumage (Plate XXX, Figs. 2 and 3) acquired by a partial postjuvenal moult, more or less of the brown body plumage being replaced by black feathers in the male, brown in the female; the white head patches are obliterated in the male, merely dulled in the female. A band of dark brown feathers develops in males along the sides and flanks, but it is less conspicuous than in the



OIDEMIA DEGLANDI.

Fig. 1. Juvenal plumage, male and female.

Fig. 4. Adult male.

Figs. 2 and 3. Juvenal plumage plus first winter, male.

Fig. 5. Adult female.

adult. The color of the bill soon approximates that of the adult but the upward swelling of the culmen seems to require a year or more for its full development, as indicated by specimens that are adult in plumage. The white of the secondaries is not so extensive as it is in adults, but this is a variable character.

It is worthy of careful note that no white crescent below and behind the eye develops until the first postnuptial moult. The little feathers of the lower eyelid, brown in the other species, in this one are dingy white in the juvenal dress and fade whiter, and when the new feathers of the first winter grow they are either a dingy white or more often tipped with brown or black which is lost as the tips wear off, but no white feathers grow during the first winter on the area where the white crescent of the adult is found.

1st Nuptial Plumage. Practically the same as the first winter plus wear or with a partial prenuptial moult and therefore chiefly a mixture of juvenal and first winter feathers, and sometimes those added by the prenuptial moult.

2d Winter Plumage acquired by a complete postnuptial moult. Adult characters are now assumed except that the bill has less of a "hump" than in older birds, but there is doubtless great individual variation. The brown band along the sides is now conspicuous and wears and fades because of its color more than do the black feathers of adjacent parts. In *fusca* and *carbo*, however, this band is as black as the breast and abdomen adjacent. A bird belated in moult (Am. Mus. No. 115554, September 17), has new wings and tail, but still retains brown juvenal feathers below and on the back, while about the head and elsewhere are scattered many brown greatly worn feathers; the white spot below the eye is small, the bill is sloping but its color is bright.

In the adult female the obliteration of the white spots of the side of the head is much more complete than in *perspicillata* and the feathers that grow upon them are basally whiter and often merely tipped with black especially those of the posterior spot.

2d Nuptial Plumage acquired by a partial prenuptial moult as shown by many specimens moulting in April and May. As this plumage is the same as the winter the only obvious effect is to freshen up the bird. A specimen (J. D., Jr., No. 8238 ♂) of May 8 shows the brown band much worn with the darker new brown

feathers coming in, while elsewhere black are replacing black and are not obvious unless studied in the fresh bird. A similar specimen was taken May 20 (J. D., Jr., No. 8242) and I have seen several others. Still another (J. D., Jr., No. 29981) of June 26 shows much wear and fading especially on the wing-quills where the pattern of each overlapping primary is impressed on the protected feather beneath. As this bird was perhaps crippled and certainly was one that had not gone north in migration, the late date of feather growth may thus be explained.

3d Winter Plumage (and all later winter plumages) (Plate XXX, Fig. 4, ♂, Fig. 5, ♀) acquired by a complete second postnuptial moult. Birds are now fully adult.

Males with a knob on their bills are probably a year and a half old at least and those with the biggest knobs two years old or more.

The variation in size and in color is very considerable, part of it being due to age and part of it being individual. The depth of color in the plumage, the size of the eye-crescent and of the white area on the wings is also variable.

Adult females are quite sooty and in fresh plumage are devoid of white about the head but as the feather-tips wear away, exposing the white basal portions of the feathers more or less distinct white patches appear on the sides of the head, especially over the site of the posterior juvenal spot. The wear is most marked in breeding specimens. Females do not assume bills with knobs, nor are the bills colored except a band near the nail.

Oidemia carbo.

The plumages and moults of this species seem to correspond to those of *O. deglandi* which it most resembles, but I have seen only eight specimens all told. It differs from *deglandi* in a bill with a concave knob that suggests a battle-ship so marked is the overhanging protuberance, the loreal feathering extending farther forward than the frontal, and the latter rounded or flattened instead of extending into an angle. Besides this it is very large and the adult male has black flanks and sides, instead of brown as in *deglandi*, a character which it shares with *fusca*. The feathering of the bill seems to be diagnostic (Plate XXIV, Fig. 6), and its color seems to be richer than in *deglandi*.

Oidemia nigra and Oidemia fusca.

It would be folly for me with the limited material I have examined to attempt to follow, as I have done with the three American species, the moults and plumages of these foreign species, but fortunately we may turn for this to J. G. Millais' "British Diving Ducks," 1913. In this splendid work will be found the best accounts yet published of the moulting of certain ducks and I agree with almost all of the views expressed therein regarding Scoters. Still, I regard the term "immature" as too vague to cover the situation satisfactorily and I find no mention is made of the prenuptial moult of adults, nor of the emarginate primary of *nigra*, while the occurrence of an "eclipse" is claimed for *nigra*, *fusca* and even *perspicillata*. I will quote Mr. Millias' own words regarding the "eclipse" in the Velvet-Scoter (*fusca*).

"The most interesting feature, however, is a patch of whitish brown eclipse feathers behind the eye and the bill which had evidently come in in July and give the bird a female appearance. In front of these feathers is a jet black patch which has, however, only been renewed once in the plumage change (July–November). The breast and lower parts are brown and the tail and wings are being renewed. The bird was incapable of flight when I shot it."

His photographic plate of the bird shows a dorsal view with the head turned to one side and without actually having the specimen in hand I must say that the "eclipse" feathers look suspiciously like worn feathers of an earlier plumage and probably were acquired at the prenuptial moult. Such feathers frequently persist on these (and other) areas and I have a specimen of the closely related *deglandi* (Am. Mus. No. 119176 ♂ ad., June 2, Mackenzie River delta) which matches the one in question very nearly, new black, growing among the brownish feathers near the bill. I consider my bird as beginning the postnuptial moult, for the flight feathers and tail are old and there are comparatively few evidences of moult elsewhere. Specimens of *perspicillata* and *americana* show no signs whatever of "eclipse" in July, August or September, although some birds are browner than others about the head, which is merely individual variation. The feathers of *perspicillata*

and *deglandi* on an average are whiter basally than are those of *nigra*, *fusca* and *americana*.

I find adult specimens showing the prenuptial moult both in *nigra* and *fusca*. An adult of *nigra* (J. D., Jr., No. 14233 ♂ ad. mid-March, near Lübeck) shows new growth well advanced and another *nigra* (Am. Mus., No. 26893 ♂ ad., May 18, Havre) still shows growth of new black feathers among rusty old black ones. An adult specimen of *fusca* (J. D., Jr., No. 24553 ♂ ad., May 5, Norway) shows chiefly rusty black feathers with new ones growing, while in another bird (J. D., Jr., 14234 ♂ ad., June 8, Norway) the growth seems to have ceased. It will be observed that the prenuptial moult in American Scoters runs over in point of time almost if not quite into the postnuptial and I really do not see where an "eclipse" could come in, but I do see how "whitish brown" feathers may well be found behind a fresh patch of "jet black" without invoking the aid of an "eclipse."

It is evident that Mr. Millais is in some doubt about it for he pens the following regarding an "eclipse" in *nigra*, viz.:

"The principal moult towards maturity commences in July when the bird is one year old. A number of temporary brown feathers, which may be called the first eclipse appear on the head and neck these being again shed in late October." . . .

"Like all the Scoters the local common Scoter has only a slight eclipse plumage if it may be so called. At the end of July a few dull brown feathers appear on the cheeks and neck. Below the lores and on the throat many of these feathers are of a dirty white color and it gives the old male a certain resemblance to a female and for which they have doubtless been mistaken. No author that I can discover mentions having seen this eclipse plumage which is retained to late in the autumn but I have examined two males killed in August in Iceland which exhibit this dress."

It seems to me that the facts have been observed correctly but interpreted wrongly. As I have stated before, the Scoters are moulting practically throughout the whole year and to say where one moult begins and another ends is not an easy matter. I have endeavored to show *when* certain characters of plumage are acquired and that the definite sequence in feather growth furnishes a key to the age of specimens. Unless the age of specimens can be determined very little progress is possible in settling questions of moult and plumage.